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ABSTRACT

Information forecasting provides a means of anticipating future message needs of a society or predicting the necessary types of information that will allow smooth social functioning. Periods of unrest and uncertainty in societies contribute to "societal information overload," whereby an abundance of information channels can create communication congestion and confusion. A program of information forecasting would involve the design of communication systems that could serve the public by providing essential information through the most appropriate channels, identifying potential message topics with their relative probabilities of occurrence and their projection over specified time, space, and population distributions. The information forecaster would be equipped to use the resources of communication research and theory, knowledge of the media, and awareness of the population he serves to identify what types of messages should be sent and to what segment of the audience. (RN)

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INFORMATION FORECASTING

by

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The events of the late sixties contributed to what may be called societal information overload. Clearly that period in American history was a time of confusion and uncertainty about the future of our society. The larger society's inability to deal with civil rights disturbances and to resolve the conflict of protesting systems through communication often resulted in mass hysteria and rumors attending both civil rights demands and political protest.

Likewise, concurrent change in other communication activities: Images, language, and the exponential growth of media and professional publications lead to a consequence of information overload Alvin Toffler calls "Future Shock." Such rapid changes in communication demands portend what will happen in the 1980's. One communication planner, concerned with urban systems, contends that information overload may be the "traffic congestion" issue of the eighties.[1] He predicts the rapidly expanding networks of telecommunication systems (e.g., CATV, two-way terminals, satellite multicast) already in various stages of implementation will leave the average citizen with quantities of information to reduce about every subject: Information Overload.

The telecommunications issue is of course a concern with the channel, the carrier of messages, the carrier of codes that may be patterned into information. Such carrier systems are vitally important in providing citizen access and interface with larger retrieval and storage systems.

The necessary existence of such systems in themselves raises questions about prior patterning and constraint of information: "uncertainty absorption."[2] That is, who decides what information, in which codes, is made accessible to the average citizen. For example, Congress recently legislated a "right to know law" giving individuals access to government stored information. Needless to say, such a law presumes that individuals know where to go for the information they need. Of course, frequently they don't. Any academician who has ever attempted to locate funding information, or information about funding information, in various government bureaucracies recognizes this almost Catch 22 dilemma.

Nevertheless for certain matters it may be possible to predict the informational needs of the public and to provide them with the interface necessary to obtain access to such information. This is the sole concern of this paper, It is the contention that the information forecasting provides a way of anticipating societal message needs in the future which may alleviate problems we labeled "societal informational overload." Discussion about telecommunication carrier systems and constraint of carrier codes is relegated to a separate paper.

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Information forecasting is considered to be a capability that communication departments, especially those located in urban settings, may offer the larger society. They, more than other academic departments, seem uniquely qualified to undertake such consultative research activities for the benefit of their constituent system.

Information forecasting is the design of communication systems that predict the information needs of people coupled to them. Thus, it implies identification of the channels and interfaces necessary to reduce message uncertainty, identification of potential message topics and their relative probabilities of occurance, and the projection of those message uncertainties over specified space, time and population distributions.

Information forecasting may be explained by analog to economic forecasting, a sort of prediction quite common to even laymen. Economic forecasting attempts to make complex probabilistic statements (or deterministic ones) about a system's economic health over time. Thus, an economic forecaster might want to predict the annual growth of the Gross National Product; or, predict the rise in real income over the next two decades, accounting for inflationary trends, capital expansion and availability of raw goods. Frequently, such predictions are rooted in the familiar Bayesian inference equations or other mathematical models. Other types of prediction rely on the inclusion of many variable relationships to predict key economic indicators.

The important point about economic forecasting however, is that such prediction attempts allow for rational planning of fiscal matters. They allow for the prediction and calculation of uncertainties (key concept) about a system's behavior over time. The calculation of uncertainty becomes especially important when we consider, as we must in human systems, events with many interactive relationships between the variables, where the forecaster is unsure how those events by themselves account for the variance in human system behavior.

That is, there is lack of theoretic basis for anticipating a particular form of relationship when the presence of random variation must be accounted for. Such situations are uncertain but yet not entirely so. The reduction of multivariate influences through such techniques as multiple correlation regression permits us to specify precisely the amount of variance we can and cannot explain, the amount of uncertainty we can and cannot reduce.

The basic rationale for information forecasting is the consideration that without information man cannot survive. Not only must man have information he needs to survive (e.g., "Where is the food?") but he must also be able to know where to find the information (access). At the most basic level, of course, all energy is information; that is, any input to a system changes the structure of that system and hence may be labeled "information." Here, however, we restrict our discussion to symbolic information.

Information is power. This is not a new statement, nor should it be startling. For example, he who knows best how to "play the system" is best able to exploit it for his own purposes. Surely the simplicity of this statement needs no further elaboration. Yet, David K. Berlo[3] has suggested that we have become a nation of symbol manipulators, rather than thing manipulators. That is, for most of us our daily concern is with information management and movement, not with management of

tools to build a cabinet, fire to heat a horseshoe and so on. If we accept such a statement, then it follows that he who is able to detect pattern, to provide context, to codify, will be the most successful. That is, he who is able to detect information where others cannot "see" its existence will be most "successful."

"Seeing" is of course the underlying motivation of science in generating knowledge claims: detecting relationships (patterns) that heretofore were considered random.

Now on one level detecting pattern is a function of education. On another, it is a function of experience. The Whorf-Sapir hypotheses talk to this point as well as do countless psychology textbooks which dwell on the principles of perceptual illusion. A major research and rehabilitative area in clinical psychology relies on these principles through the utilization of Rhorshach inkblots: The patient must pattern the seemingly random inkblots into normative images, else he is "deviant." Generally, the client patterns inkblots to reflect his own experiences and projections and provides the therapist with clues about underlying problems and "meaning."

But if information is power and pattern is largely a function of education and experience, how do we get power--patterning ability--into the hands of all who need it and seek it? Through information forecasting.

Informational power belongs, in a democracy, to all of the people. Man must be able to obtain, without constraint, information he needs for survival.

Without such information the indigent remain unaware of where to go to for information about the aid a larger, beneficient society provides (e.g., welfare programs); the bureaucrat operates without data on which to base his policy decisions; and all men are less able to check the operation of structures that support our society and our civilization.

What do informational constraints look like that necessitate information forecasting? Such constraints seem obvious: Space, hence travel (e.g., should a society heavily individual-automobile oriented put transportation restrictions on gaining access to information from the social security office, the welfare office, the statehouse?); time restrictions (e.g., mail); economic restrictions (e.g., money to go to a doctor to get symptom diagnosis); energy restrictions (e.g., effort required to personally seek information from a regional welfare office).

How would information forecasting alleviate and overcome such restrictions?

Information forecasters would anticipate the informational needs of the society in which it takes place. In an urban setting, the need for health and welfare information might be paramount, or the need for narcotic overdose treatment information might be determined. Thus, the information forecaster would delineate what type of audience needs this information (and determine the range of topics about which information is needed); obtain the information from the appropriate agencies, and provide for its optimal dissemination through carriers having been identified as maximizing exposure.

At the simplest level a forecaster might promulgate factual data about venereal disease symptoms and treatment through the mass media. The mass media overcome a number of restrictions encumbering other communication modalities: space, time, energy and economics. For example, television has shown to be a highly utilized medium by inner city poor: why not disseminate venereal disease information at prime times through such a medium?

At its simplest, then, what is needed is someone to identify the informational needs and to subsequently identify the channels that would get the information out. Yet the problem is more complex than apparent because information forecasters must also anticipate future message needs. Thus, 10 years ago the information forecaster, were he around, would have predicted the epidemic proportions of venereal disease and the need for straightforward factual information. At that point, the information forecaster would have predicted the information distributions needed to provide factual information to the projected affected people types.

We have made a number of practical statements about the need for information and the role of information forecasting in the larger society to alleviate those disparate needs. Part of the role of the information forecaster, we mentioned, was the calculation and projection of message uncertainties across various space, time and population distributions.

Such a definition implies consideration of some system, or a number of coupled systems. Thus in order to gauge how much uncertainty exists in a system, in order to be able to specify the entropy in a system, one must know the boundaries of that system, the message alternatives and the probabilities of their occurance.

Uncertainty refers to the amount of information needed to describe or to organize ("pattern") systems. And the information needed to completely understand a system is equal to the amount of uncertainty that exists about that system.

As Rapoport and Cherry remind us, however, there are certain drawbacks to utilizing this concept in the social sciences. For one thing, frequently we deal with open systems whose boundaries are not always determinable, nor are we always able to determine the inputs and outputs (as can be done much more accurately in economics through the elaborate information retrieval system of money); that is, we are frequently unable to identify the ensemble of alternatives or their probabilities. Such an inability to identify the total uncertainty in a system, coupled with the problematic conditions of humans who learn, thus changing the relative probabilities of alternatives, led Daniel Berlyne to conclude that all applications of information theory to social behavior must explicitly stipulate these pitfalls.

Yet, communication researchers frequently identify problems and we are able to identify alternative communication approaches to their solution. We make an attempt at describing the communication uncertainty that exists. Or looking at this another way, we might say that a theoretic motivation for communicating with anyone is the reduction of uncertainty. We want to equalize [Ed. note: optimize? increase?] our knowledge of the alternatives. The coupling system, communication, enables man to reduce this uncertainty. As we know, the less fidelity the coupling system presents, the more uncertainty is introduced in the system, so that ultimately the net reduction in uncertainty might be zero:

as much uncertainty has been reduced by the communication event as has been introduced by the event itself through, for instance, metacommunicational intrusions, environmental noise, language barriers or meaning misinterpretations. This of course is frequently the case between protestors and reconciliators, where the coupling system is so ineffective in connecting two dissimilar communication styles that the net reduction in uncertainty is zero, and frequently the confrontation only raises uncertainty for all participating systems.

I have suggested elsewhere[4] that a function of communicators in such instances is to provide information to the parties involved. I further suggested that this information might be about strategies of communication, persuasion, or what have you. In effect, I suggested that such information be largely metacommunicational, on the assumption that most uncertainty is introduced at this level. In other words, it is a thesis of this paper that most of our uncertainty about stimuli is due to our inability to metacommunicate about our uncertainty. That is, man frequently is unable to even communicate about his information needs.

Allied to the necessity of being able to locate information is an implication for those who control vertical communication (government) channels that the types of information that will need to be located when conditions change, in the future, in emergencies, etc., must now be determined. That is, there is a need for information forecasting to forestall another information explosion similar to that which we experienced in the late sixties.

It can be argued that information forecasting increases in importance as the density of the information consuming public increases. Why? Because behavioral variability increases with increasing N. The more variability, as George Miller suggests, the more uncertainty and the more information is needed to describe that variability and reduce the uncertainty. Population density means information density [Ed. note: not only density but also complexity, e.g., more need for metacommunication systems?]: more information is existent, more information is sought and more channels may be utilized. In this regard, an urban department of communication can best serve the community by developing trained specialists and operating community programs oriented toward forecasting the informational needs of the urban setting. Of course as population density increases message fidelity decreases due to the increasing number of links in any possible communication network. [Ed. note: should such departments be centrally concerned with remediation of low-fidelity systems?]

Finally, we should consider what an information forecaster looks like and precisely what he does.

An information forecaster looks like a communication researcher with a practical bent. He is able to utilize sophisticated modeling techniques (simulation, multiple regression correlation, for example) to be able to identify information distributions across time, and extrapolate those maps to fit the territories of the future. He must have a knowledge of carrier systems and thus be steeped into the capabilities of existing media and new telecommunications systems. In urban settings, a thorough knowledge of interpersonal networks would be a necessity. He must also be able to identify contexts for communication.

In the latter case, of course, he may on a day-to-day level work closely with urban planners and sociologists. He or someone else will have to project trends: the onset of venereal disease; the growth of drug abuse in the U.S.; popular resistance to the Viet Nam War. However, the information forecaster's main bag of tools comes into play once the problems have been identified. He must then anticipate the types and quantities of information that will not only offset such trends, but be resolving in their utility.

A number of tools come to mind. Diffusion modeling is perhaps one approach. For through such a body of theory one can identify who the potential opinion leaders will be for a particular topic; and what their role will be. For instance, an opinion leader for political protest is probably someone qualitatively different than an opinion leader about the symptoms of venereal disease. In fact, in the latter instance the concept of opinion leadership may not even be practicable.

The information forecaster would then identify the communication networks existing within the social system. He must be able to specify how messages may be inserted into those networks without fidelity loss. He must be able to predict their dissemination.

Surely the reader will realize a number of problems with the preceding description. For instance, network distribution will differ according to media-telecommunication availability. The communication research literature provides a plethora of data about the relative utilization of the media. However, it is probable that the network links will differ substantially according to the typ of messages being disseminated: whether the messages are directed to opinion leaders; to the referents of the messages (in the case of VD to those with the disease, or those who think they may have symptoms); to those influential with the referents of the messages, and so on. Further, persuasive messages, those propagandistic in nature, may demand entirely different kinds of distribution than factual, utilitarian messages. Conceivably, the information forecaster should be in a position to advise policy makers about the types of messages most effective for a particular purpose.

I mentioned earlier that distribution of messages needs could be projected for various populations, areas and times. In considering populations, one considers audience analysis, relying on the research literature and pilot studies to build distribution maps. For projections about space one may rely on the work of, say, quantitative geographers to predice information dissemination through various neighborhoods. Of course, considering time involves also an analysis of the movement of people across space.

A typical problem that might have been the domain of information forecasters ten years ago is drug abuse. Building prediction models about the growth of drug abuse, based on data available then was feasible; such computation involves standard population growth models (see Coleman),[5] execpt that the information forecaster would also have been able to predict (were he working without the aid of sociologists), via the out-migration of populations from the cities to the suburbs, that drug use would go along. If drug use went along, then the consequent message uncertainty about drug use would increase correspondingly.

Clearly, an economic/moral decision would have to be made about the level of message uncertainty tolerable in a society. It costs money to provide up-to-date information to all. Perhaps "hitting" key opinion leaders and neighborhood organizations might be sufficient in the beginning.

Thus the information forecaster would have to anticipate the types of information that would be sought about drugs. He could look at history: in areas where drug abuse had been prevalent what type of information was most often sought from hospital emergency rooms and clinics? Or, he could project: given the spread of drug abuse to to the suburbs, friends and close acquaintances might be the only initial communication links with drug users. Thus, initial message channel efforts should be directed at them.

Aligned to the problem of identifying who to direct initial information to, is the problem of what type of information to send. Perhaps at one state of a campaign persuasive information will be better; later perhaps two-sided messages; finally, treatment information--factual information--might always be disseminated concurrently.

In conclusion, the job of information forecaster comes down to predicting what types of information will be necessary in the future to allow the larger society to function smoothly. Yet, the information forecaster might also predict the types of information necessary <u>today</u> to make informational power more evenly distributed: How might information about various government agencies and offices, about government benefits (and application for them) be distributed? To whom should this information go?

In an urban setting, how could information about neighborhood precincts best be disseminated; how could neighborhoods be interfaced with a large scale urban information retrieval system?

Perhaps ultimate answers to these questions will demand the establishment of neighborhood information stations, as a prelude to in-the-home terminals; stations in which CATV and terminal access are provided to any user without restriction. The ultimate excuse for being late then may not be, "Oh, I was late waiting for the bus," but become, "Oh, I was late waiting for the information."

Clearly this is an expansive topic. I only provided a broad, "food for discussion" overview. I did not discuss exactly the methodology of information forecasting; such is the content of a separate and forthcoming discussion. Needless to say, the potential of information forecasting is not limited by these suggestions.

FOOTNOTES

1 Kas Kalba, "Urban Telecommunications: A New Planning Context," paper presented at Confer-In 1972, American Institute of Planners.

2 See J.H. March and Herbert A. Simon, <u>Organizations</u>, New York: Wiley, 1958.

3 David K. Berlo, <u>The Process of Communication</u>, New York: Holt, Rinehart and Winston, 1960.

4 Gerhard J. Hanneman, "Rational Communication and Message Uncertainty," presented to the Special Session on Violence, International Communication Assn, 1971, Phoenix.

5 James S. Coleman, <u>Introduction to Mathematical Sociology</u>, New York: The Free Press, 1964.